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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/729,756	12/05/2003	Shoupu Chen	87121SHS	3184

7590 03/02/2007  
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EXAMINER
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MACKOWEY, ANTHONY M

ART UNIT	PAPER NUMBER
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2624

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/02/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/729,756

Applicant(s)

CHEN ET AL.

Examiner

Anthony Mackowey

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/5/03; 4/1/05</u> .   | 6) <input type="checkbox"/> Other: ____.                          |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2, 3, 10 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 2 recites, "wherein the rotation angle is an accumulated rotation angle from a plurality of rotated in vivo images." It is unclear whether the rotation angle refers to the rotation angle recited in step (b) of claim 1, the rotation angle recited in step (d) of claim 1, or both. Claims 3, 10 and 11 depend from claim 2.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3, 5-11, and 13-16 rejected under 35 U.S.C. 102(e) as being anticipated by US 7,106,981 to Wyman et al. (Wyman).

Regarding claim 1, Wyman discloses a digital image processing method for automatic axial rotation correction of in vivo images (col. 6, lines 34-37), comprising the steps of:

- a) selecting, as a reference image, a first arbitrary in vivo image from a plurality of in vivo images (col. 6, lines 40-45);
- b) finding a rotation angle between a second arbitrary in vivo image selected from the plurality of in vivo images and the reference image (col. 6, lines 57-61; col. 8, lines 23-37; col. 9, lines 43-49; col. 10, line 48 - col. 11, line 3; col. 11, lines 41-58, Wyman teaches applying affine transformations including rotating the image sets in the image registration. The Examiner believes the determination angle of a rotation angle between the reference image and the second image is inherent to the rotation transformation of registration method taught by Wyman.);
- c) correcting the orientation of the second arbitrary in vivo image, with respect to orientation of the reference image and corresponding to the rotation angle (col. 6, lines 61-64; col. 8, lines 23-37; col. 9, lines 43-49; col. 10, line 48 - col. 11, line 3; col. 11, lines 41-58);
- d) finding the rotation angle between other selected in vivo images and the reference image (col. 6, lines 57-61; col. 8, lines 23-37; col. 9, lines 43-49; col. 10, line 48 - col. 11, line 3; col. 11, lines 41-58; col. 9, lines 1-6, Wyman teaches applying affine transformations including rotating the image sets in the image registration. The Examiner believes the determination angle of a rotation angle between the reference image and the second image is inherent to the rotation transformation of registration method taught by

Wyman. Wyman further teaches bringing an arbitrary number of images, or image sets into alignment.); and

e) correcting for the other selected in vivo images that do not match the reference image's orientation and where there exists a rotation angle between the other selected in vivo images and the reference image (col. 6, lines 61-64; col. 8, lines 23-37; col. 9, lines 43-49; col. 10, line 48 - col. 11, line 3; col. 11, lines 41-58; col. 9, lines 1-6).

Regarding claim 2, Wyman further discloses the rotation angle is an accumulated rotation angle from a plurality of rotated in vivo images (Fig. 5; col. 8, line 60 – col. 9, line 6; col. 10, line 48 – col. 11, line 3, Wyman teaches registration of two image sets, the sets comprising one or more images, therefore, the rotation angle inherent to the rotation transformation is based on a plurality of images.).

Regarding claim 3, Wyman further discloses the step of correcting the orientation of any arbitrary in vivo image, with respect to orientation of the reference image and corresponding to the rotation angle uses an accumulated correction angle derived from the accumulated rotation angle (Fig. 5; col. 8, line 60 – col. 9, line 6; col. 10, line 48 – col. 11, line 3).

Regarding claims 5 and 6, Wyman further discloses the rotation angle is defined in a right-hand system or a left-hand system and angle is rotated counter-clock wise or clockwise relative to the reference image's orientation, such that the rotation angle is a signed value (Fig. 8; Fig. 9E; col. 8, lines 1- 37; col. 11, line 41 – col. 12, line 4; col. 14, lines 60-62).

Regarding claim 7, Wyman further discloses the plurality of in vivo images have a plurality of feature points, and wherein the plurality of feature points are used for finding an orientation difference between two in vivo images (col. 6, lines 46-64).

Regarding claim 8, Wyman further discloses an origin of a two-dimensional coordinate system of the in vivo images, thus defining an image plane, is at an image's center (Fig. 5; col. 10, lines 48 – col. 11, line 3, Wyman clearly shows two-dimensional images oriented in an X-Y coordinate system, with Z coordinate identifying each image's two-dimensional plane location in the stack of images, with an origin at the intersection of the intersection of axes. It is clear if the image sets are limited to a single image (as suggested by Wyman at column 8, lines 63-65), the coordinate system would be limited to a two-dimensional system as there is no “stack” of images”), and further comprising the steps of:

- a) collecting the plurality of feature points that reside on an axis of a first image plane (Fig. 5; col. 6, lines 46-54; col. 10, line 48 – col. 11, line 3);
- b) finding a corresponding plurality of feature points in a second image plane (col. 6, lines 46-54; col. 10, lines; col. 10, line 48 – col. 11, line 3);
- c) determining whether a feature point that resides on the axis of the first image plane moves off the axis in the second image plane (col. 6, lines 54-57); and
- d) measuring the feature point's movement off the axis in the second image plane to determine the rotation angle and its direction (col. 6, lines 57-64; col. 10, line 48 – col. 11, line 3).

Regarding claims 9-11 and 13-16, Wyman further discloses a computer storage medium having instructions stored therein for causing a computer to perform a method (col. 11, lines 18-39).

*Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wyman in view of US 2003/0229268 to Uchiyama et al. (Uchiyama).

Regarding claim 4, Wyman is silent with regard to the rotation angle measured with respect to an optical axis of an in vivo camera used to capture the plurality of in vivo images, and wherein the optical axis is perpendicular to an image plane and is parallel to the in vivo camera's travel trajectory derivative. Wyman example of registration is between MRI and CT image, however, Wyman clearly teaches the techniques are applicable to image registration for medical imaging and can also be used for registering any sets of 2D or 3D images. Uchiyama teaches an encapsulated endoscope (imaging) system in which images are captured and require rotation of the to properly align them to one another, the rotation angle measured with respect to an optical axis of an in vivo camera used to capture the plurality of in vivo images, and wherein the optical axis is perpendicular to an image plane and is parallel to the in vivo camera's travel trajectory derivative (Figs, 3, 9, 10, 12, 13, 14, 15, 16; paragraphs 6, 42, 55-58).

The teachings of Wyman and Uchiyama are combinable because they are both concerned with medical image processing, specifically rotating the medical images to properly align them for display. It would have been obvious to one of ordinary skill in the art at the time the invention was made that the image registration techniques taught by Wyman could apply to

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images captured by encapsulated endoscope system such as the one taught by Uchiyama (and the present invention) as it is clear the techniques taught by Wyman are applicable to a wide range of captured images and images captured by the systems such as that taught by Uchiyama require alignment because of the of the rotation of the capsule as it moves through the body.

Regarding claim 12, Wyman further discloses a computer storage medium having instructions stored therein for causing a computer to perform the method of claim 4 (col. 11, lines 18-39).

### *Conclusion*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 5,793,901 to Matsutake et al. is cited for teaching detecting the degree of misregistration and angle of misrotation of an object image.

US 5,987,191 to Suzuki is cited for teaching image registration comprising clockwise and counterclockwise rotation with signed rotation angle values.

US 6,178,271 to Maas, III is cited for teaching estimation of a correction angle to rotationally align images.

US 6,266,453 to Hibbard et al. is cited for teaching scaling, rotation and translation to align anatomic features in medical images.

US 6,909,792 to Carrott et al. is cited for teaching registration of medical images including finding the corresponding rotation angle.

US 6,950,542 to Roesch et al. is cited for teaching transforming to images into one another including an angle of rotation and utilizing feature points.



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***Contact Information***

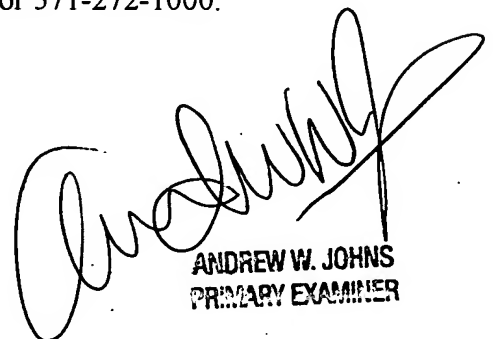
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Mackowey whose telephone number is (571) 272-7425.

The examiner can normally be reached on M-F 9:00-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bella Matthew can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AM  
2/27/07



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PRIMARY EXAMINER